NUTRITION SCIENCE

COURSE DESCRIPTION

Nutrition Science is a course designed to focus on the practical application of scientific concepts. It incorporates the science of the production, processing, evaluation, and utilization of foods and relates scientific concepts and processes to practical applications in nutrition. Students use scientific methods in laboratory experiments to facilitate the understanding of the human body, food and nutrition, and science. The course utilizes a team-teaching approach with a family and consumer sciences and a chemistry or biology teacher.

The integration of Family, Career and Community Leaders of America (FCCLA) provides students with opportunities for leadership development, personal growth, and school/community involvement.

Pre-requisite:	None A credit in physical science or biology is recommended.
Recommended Credits:	1 This credit satisfies either one credit of life science (if team-taught with a biology teacher) or one credit of physical science (if team-taught with a chemistry teacher) required for graduation. The University of Tennessee and Tennessee Board of Regents' schools approve it for admissions.
Recommended Grade Level:	10-12

NUTRITION SCIENCE STANDARDS

1.0 Students will analyze the interrelationship of food, nutrition, and science.

2.0 Students will relate nutritional practices to the health of the individual in a global society across the life span.

3.0 Students will use knowledge of metabolism and digestion to establish lifelong habits of good nutrition.

4.0 Students will examine methodology for use of the scientific laboratory to conduct and report results of food science experiments.

5.0 Students will analyze methods used in food product development and marketing.

6.0 Students will evaluate a variety of changes, including chemical and physical, that affect food product quality.

7.0 Students will apply science process skills when analyzing the structure and composition of food.

8.0 Students will analyze methods used and factors involved in the scientific processing of food.

9.0 Students will analyze career paths within the food science, dietetics, and nutrition industries.

10.0 Students will demonstrate leadership, citizenship, and teamwork skills required for success in the family, workplace, and community.

NUTRITION SCIENCE

STANDARD 1.0

Students will analyze the interrelationship of food, nutrition, and science.

LEARNING EXPECTIONS

The student will:

1.1 Define the study of the science of food and nutrition and distinguish from a traditional food preparation course.
1.2 Explain the interrelationship of food, nutrition, and science.
1.3 Describe the main goal of food scientists.
1.4 Evaluate food intake related to human needs.
1.5 Analyze factors that influence food choices and habits.

PERFORMANCE STANDARDS

The student:

1.1A Defines nutrition science and food science.
1.1B Explains the difference between food science and food preparation.
1.1C Analyzes how studying food science now can benefit them in the future.
1.2 Describes the differences between food preparation, nutrition science, food science, and food management in production and services.
1.3A Summarizes how food products and processing methods have changed in modern history due to contributions of food scientists.
1.3B Describes the main goals and activities of food scientists.
1.4 Examines the physical and psychological needs related to food.
1.5 Compares the various influences on an individual's food choices and habits.

SAMPLE PERFORMANCE TASKS

- Complete the "Science Attitudes Survey" and discuss student responses.
- Construct single definitions of nutrition science and food science.
- Locate newspapers and/or magazine articles related to the science of nutrition and food. Give brief oral presentations.
- Outline the history of food science.
- Select one item from the home pantry or refrigerator land list as many aspects of food science as possible that were necessary for the product to be made available to consumers.
- Design a bulletin board with pictures and captions that illustrate food products that are the result of the application of food science principles.
- Invite a food scientist to class to explain the interrelationship of food, nutrition, and science.
- Use "Maslow's Hierarchy of Needs" to discuss how food relates to basic human needs.

- Working in small groups, students research regional foods for an assigned areas of the country or abroad. Report findings to the class.
- Play a word association game using food.
- Using newspapers and magazines, cut out words and phrases used to sell certain foods to consumers.

INTERATION/LINKAGES

Family and Consumer Sciences (FACS) National Standard 9.3, Biology I Gateway Standards, English II Gateway Standards, technology skills, Family, Career and Community Leaders of America (FCCLA) activities, newspapers, public media, SCANS (Secretary's Commission on Achieving Necessary Skills)

NUTRITION SCIENCE

STANDARD 2.0

Students will relate nutritional practices to the health of the individual in a global society across the life span.

LEARNING EXPECTATIONS

The student will:

2.1 Analyze various guidelines for good nutrition that promote the health of the individual across the life span.
2.2 Analyze the impact and alleviation of food and nutrition problems in the world.
2.3 Determine nutritional needs that promote optimum health across the lifespan addressing the diversity of people, culture, and religions.
2.4 Examine food and nutrition misinformation.

PERFORMANCE STANDARDS

The student:

2.1A Uses the Dietary Guidelines to evaluate dietary patterns.
2.1B Classifies foods according to the Food Guide Pyramid.
2.1C Analyzes a daily intake of food in terms of serving sizes and recommended servings.
2.1D Uses Recommended Dietary Allowances to evaluate dietary patterns.
2.2A Concludes probable causes for the world food crisis.
2.2B Determines possibilities for providing enough food for all.
2.2C Relates current world health concerns to nutrition and food practices.
2.2D Identifies the goals of various agencies in preserving the safety of the world's food supply.
2.3A Identifies health concerns related to diet in various stages of the life cycle.
2.3B Analyzes methods of improving diets and lifestyle in order to address areas of concern.
2.3C Determines eating habits that lead to a higher incidence of diet-related diseases.
2.3D Plans diets to meet special dietary needs of individuals.
2.4A Distinguishes between food facts and food fallacies.
2.4B Demonstrates how to obtain reliable nutrition information.
2.4C Examines the effects of eating disorders.

SAMPLE PERFORMANCE TASKS

- Working in pairs, students analyze a given daily intake of food in reference to whether the basic food guidelines were met.
- Collect newspaper/magazine articles dealing with the world food problems and report them to the class.

- Research a less developed country and report what is being done to increase the food supply.
- Brainstorm, list, and discuss the consequences to a child due to hunger/malnutrition.
- Research possible causes for the world food crisis and suggest workable ways to alleviate the problem.
- Discuss food habits of children and the factors that contribute to childhood obesity.
- Working in groups, students identify typical concerns in adolescent diets and problem-solve to make specific recommendations for improvement.
- Evaluate a fast-food meal and make suggestions to increase the nutrient value.
- Research and review current information on nutrition and related diseases.
- Revise menus to illustrate special diets.

INTEGRATION/LINKAGES

Tennessee Department of Health, FACS National Standards, Biology I Gateway Standards, FCCLA activities, English II Gateway Standards, technology skills, newspaper, magazines, SCANS

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STANDARD 3.0

Students will use knowledge of metabolism and digestion to establish lifelong habits of good nutrition.

LEARNING EXPECTATIONS

The student will:

3.1 Analyze the relationships between calories, food, and energy

3.2 Examine the digestive system and the role of enzymes in digestion and food preparation.

PERFORMANCE STANDARDS

The student:

3.1A Explains the relationships between calories, food, and energy.

3.1B Compares the amount of energy in different foods in terms of calorie value.

3.1C Explains basal metabolism and factors that affect the rate.

3.1D Explains the relationship between food intake, caloric expenditure, and body composition.

3.1E Evaluates body composition in terms of long-and-short-term health implications.

3.2A Explains the functions of the organs of the digestive system.

3.2B Demonstrates factors that affect enzymatic activity and relate to digestion and food preparation.

SAMPLE PERFORMANCE TASKS

- Complete a lab experience, "Kilocalories in Food". Based on the laboratory experience, explain the relationship between calories, food, and energy.
- Calculate personal BMR using a given formula.
- Estimate body composition.
- In lab, construct a simple calorimeter.
- Construct a life-size model of the human digestive system out of construction paper. Label each part and describe its function(s).
- Complete the lab, "Enzymatic Digestion of Starches".
- Trace the pathway of a hamburger through the digestive system.

INTEGRATION'LINKAGES

Biology I Gateway Standards, English II Gateway Standards, Algebra I Gateway Standards, FACS National Standards, FCCLA activities, SCANS

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STANDARD 4.0

Students will examine methodology for use of the scientific laboratory to conduct and report results of food science experiments.

LEARNING EXPECTATIONS

The student will:

4.1 Apply proper safety techniques for the laboratory.
4.2 Identify the location and demonstrate the correct use of emergency equipment in the laboratory.
4.3 Identify basic laboratory equipment, rules for usage, and performance techniques.
4.4 Demonstrate use of the scientific method when participating in food science laboratory experiences.

PERFORMANCE STANDARDS

The student:

4.1 Uses appropriate safety techniques in the laboratory.
4.2 Demonstrates knowledge of location and correct use of emergency equipment in the food science laboratory.
4.3 Uses basic laboratory equipment safely and correctly.
4.4 Demonstrates the ability to complete a laboratory report based on the use of the scientific method.

SAMPLE PERFORMANCE TASKS

- Role-play correct and incorrect attire and actions for the assurance of laboratory safety.
- Demonstrate the use of emergency equipment.
- Complete the experiment, “Using the Triple Beam and Electronic Balances”.
- Play “Lab Equipment Bingo”.
- Complete the experiment “Precision in Measurement”.
- Practice measuring temperatures of safe substances.
- Using a sample report form, familiarize students with format and organization of a correctly written laboratory report.
- Complete a simulated lab report form.

INTEGRATION/LINKAGES

Biology I Gateway Standards, Algebra I Gateway Standards, FACS National Standards, technology skills, SCANS

NUTRITION SCIENCE

STANDARD 5.0

Students will analyze methods used in food product development and marketing.

LEARNING EXPECTATIONS

The student will:

5.1 Examine the sensory factors that make up the sensory characteristics for tasting food.
5.2 Demonstrate controlled sensory testing and rating techniques.
5.3 Evaluate food label information.

PERFORMANCE STANDARDS

The student:

5.1A Compares reasons for evaluating food products subjectively and objectively.
5.1B Explains how taste and aroma combine to give foods their flavors.
5.2 Conducts sensory testing laboratory experiments.
5.3A Researches the federal government's role in regulating label information.
5.3B Analyzes food claims and wordings.
5.3C Uses food labels for comparison shopping.

SAMPLE PERFORMANCE TASKS

- Create collages of magazine pictures of food to illustrate how food appeals to the senses.
- Conduct an experiment of odor recognition.
- Select items to use and conduct an experiment of flavor comparison.
- Conduct a soft drink comparison sensory evaluation.
- Organize a sensory laboratory evaluation conducive to evaluating food products subjectively and objectively.
- Brainstorm reasons laws were passed regulating labels on food.
- Research the government agencies responsible for regulation of food labels.
- Working in groups, analyze and compare the information on labels of selected foods.
- Using teacher prepared worksheets, students compare label information for comparison shopping.

INTEGRATION/LINKAGES

FACS National Standards, Biology I Gateway Standards, English II Gateway Standards, Algebra I Gateway Standards, Technology skills, periodicals, SCANS

NUTRITION SCIENCE

STANDARD 6.0

Students will evaluate a variety of changes, including chemical and physical, that affect food product quality.

LEARNING EXPECTATIONS

The student will:

6.1 Relate differences in chemical and physical changes to the states of matter.
6.2 Identify chemical symbols and use these symbols in writing chemical formulas and equations.
6.3 Demonstrate and conclude how mixtures are represented in various food products.
6.4 Demonstrates how the major leavening agents are used in foods and describe the actions observed.
6.5 Demonstrate the difference between the process of fermentation and pasteurization and explain the usage in food technology.

PERFORMANCE STANDARDS

The student:

6.1A Relates matter, energy, and the atom to nutrition science.
6.1B Demonstrates the difference between the solid, liquid, and gaseous states of matter using water.
6.1C Examines Dalton's Theory and the Modern Atomic Theory.
6.1D Demonstrates the testing procedure for acids and bases.
6.2A Examines atomic numbers and mass numbers.
6.2B Completes selected information on a blank periodic table.
6.2C Translates chemical equations into sentences.
6.3A Examines various food products to determine kinds of mixtures represented.
6.3B Calculates solution concentration using mass percent.
6.4 Conducts experiments altering leavening agents and mixing instructions/techniques.
6.5 Describes the difference between the process of fermentation and pasteurization and explains the importance of these in food technology.

SAMPLE PERFORMANCE TASKS

- Bring in articles form newspapers to discuss new discoveries and how science can improve quality of life.
- Complete the "Dancing Raisins" laboratory to demonstrate density of matter and buoyancy.
- Complete the laboratory experiment, "Laboratory Exercise: Indirect Measurement."

- Build models of chemical compounds using toothpicks, marshmallows, and gum drops
- Test common foodstuffs for acid/base properties using litmus paper.
- Demonstrate three types of solutions using cold and hot tea.
- Demonstrate the experiments, “Making an Emulsion” and “Salt and Ice Cream”.
- Demonstrate the experiment, “Comparison of Leavening Agents”.
- Demonstrate fermentation process through observation of the fruit preparation needed to make the “30-Day Friendship Cake’.
- Participate in a tasting laboratory using “Dairy Food Taste Test” to record observations.

INTEGRATION/LINKAGES

FACS National Standards, Biology Gateway Standards, Algebra I Gateway Standards, technology skills, periodicals, newspapers, SCANS

NUTRITION SCIENCE

STANDARD 7.0

Students will apply science process skills when analyzing the structure and composition of food.

LEARNING EXPECTATIONS

The student will:

7.1 Examine the properties and functions of water.
7.2 Analyze the structure and composition of carbohydrates and fiber.
7.3 Analyze the properties and composition of lipids in relation to their functions in food preparation and in the body.
7.4 Describe the chemical nature and molecular structure of protein and the functions of protein in food.
7.5 Examine the types, functions, sources, and deficiencies of vitamins and minerals.

PERFORMANCE STANDARDS

The student:

7.1A Relates the properties of water to phase changes and impurities in water.
7.1B Explains the functions of water in food, food preparation and in the body.
7.2A Demonstrates and explains the chemical reaction that occurs when plants produce carbohydrates.
7.2B Defines the types of sugars including examples of each.
7.2C Describes the normal regulation of glucose level in the blood and the conditions of low and high glucose levels.
7.2D Demonstrates the process of carmelization.
7.2E Compares the structure of types of carbohydrates as to how these structures as to how these structures affect cooking properties.
7.2F Relates gelatinization, paste, retrogradation, and synersis to starch cookery.
7.2G Examines the properties of and the importance of fiber in the diet.
7.3A Compares the properties of saturated and unsaturated fatty acid.
7.3B Identifies foods containing different types of triglycerides, saturated, and unsaturated fat and explains their role in heart disease.
7.3C Explains the functions of fat in food preparation and in the body.
7.3D Explains how lipid oxidation can be controlled in food.
7.4A Describes the chemical structure of protein.
7.4B Explains what happens during the denaturation of protein and how the process occurs.
7.4C Demonstrates ways in which protein is used in food preparation.
7.5A Classifies water-and-fat soluble vitamins into categories.
7.5B Explains the functions of vitamins and minerals in the body.
7.5C Evaluates food sources in terms of various vitamins and minerals.

7.5D Distinguishes between major and trace minerals and list examples in each category.
7.5E Explains interrelationships among nutrients.

SAMPLE PERFORMANCE TASKS

- Construct models of a water molecule using small styrofoam balls, marshmallows, or gumdrops and toothpicks.
- Perform an experiment on the boiling point of water.
- Conduct a "Water Taste Test".
- Taste various fruits and vegetables that contain carbohydrates.
- Invite a person who has diabetes or a health care professional to discuss diabetes with students.
- Complete the laboratory experiment, "Making Fondant".
- Identify sweetening agents listed on food labels.
- Complete the "Rock Candy" laboratory experiment.
- Make fudge to show the effects of interfering agents and agitation.
- Complete the laboratory experiment, "Sugar and Starch and Everything Nice."
- Research recent findings concerning fiber and cancer prevention.

INTEGRATION/LINKAGES

Biology I Gateway Standards, English II Gateway Standards, FACS National Standards, technology skill, SCANS

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STANDARD 8.0

Students will analyze methods used and factors involved in the scientific processing of food.

LEARNING EXPECTATIONS

The student will:

8.1 Examine the use of additives in food processing.
8.2 Evaluate the use of thermal preservation methods in the processing of food.
8.3 Explain the process and methods of processing foods by dehydration.
8.4 Compare the processes of fermentation and curing.
8.5 Evaluate current trends in commercial food preservation.
8.6 Evaluate the causes and prevention of food contamination and spoilage.
8.7 Analyze major components and stages of food product development.

PERFORMANCE STANDARDS

The student:

8.1A Identifies the agencies responsible for regulating the safety of food additives and the goals of the agencies.
8.1B Researches the pros and cons of the use of additives in foods.
8.1C Examines natural, unnatural, and nutritional additives that are most commonly used, reasons for use, and issues involved.
8.2A Examines techniques of food preservation by freezing and canning (hot and cold processing).
8.2B Explains how botulism develops, grows, and the symptoms occur.
8.2C Develops guidelines for prevention of botulism.
8.2D Diagrams the methods of commercial canning and compares to principles of home canning.
8.3A Explains the types of preparation and methods used for dehydrating foods.
8.3B Explains the purpose of dehydration and gives examples of correct storage.
8.3C Demonstrates the various methods of dehydration.
8.3D Describes methods and characteristics of freeze-drying in commercially-prepared foods.
8.4A Compares food processing and preservation of today and two centuries ago.
8.4B Explains how fermentation and curing are used commercially in food processing.
8.5A Examines the issues surrounding the use of irradiation in commercially-prepared foods.
8.5B Relates the importance of proper packaging to food processing.
8.6A Describes the purpose of the governmental agencies responsible for food safety.
8.6B Demonstrates formation of food intoxication and food infection.
8.6C Develops guidelines for preventing food poisoning.

8.6D Explains the major types of food spoilage commonly encountered.
8.7A Identifies the major components involved in new food product development.
8.7B Develops a model depicting various stages of product development.

SAMPLE PERFORMANCE TASKS

- Research and debate the pros and cons of additives.
- Find foods that contain flavors, sweeteners, colors, stabilizers, and preservatives. Evaluate the use of these various additives.
- Using various foods, identify the type of additive (natural, unnatural, or nutritional) found in each food.
- Complete worksheets on "Botulinum-Forming Foods".
- Brainstorm to develop a list of foods that are commonly canned at home.
- Demonstrate steps to prevent botulism in home-canned foods.
- Compare the weight and appearance of beans that have been soaked overnight and some that have not.
- Dry fruits using different methods of dehydration.
- Make sauerkraut in a laboratory. Discuss how this is a type of fermentation.
- Generate a list of foods that are cured commercially and at home.
- Survey students on their views of irradiated food.
- Send students on a treasure hunt for food packaging and analyze the packaging.
- Make posters on food safety procedures to post in the food labs.

INTEGRATION/LINKAGES

Biology I Gateway Standards, English II Gateway Standards, FACS National Standards, FCCLA activities, technology skills, SCANS

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STANDARD 9.0

Students will analyze career paths within the food science, dietetics, and nutrition industries.

LEARNING EXPECTATIONS

The student will:

9.1 Evaluate jobs and preparation requirements for careers within the food science, dietetics, and nutrition industries.

9.2 Assess personal qualifications, interests, values, and educational preparation necessary for employment in a career in nutrition and the food science industries.

PERFORMANCE STANDARDS

The student:

9.1 Investigates the jobs and preparation requirements for careers within the food science, dietetics, and nutrition industries.

9.2 Compares personal qualifications, interests, values, and educational preparation necessary for employment in nutrition and the food industry.

SAMPLE PERFORMANCE TASKS

- Formulate a list of entry level skills relating to the food science industry.
- Invite a guest to lead a class discussion about the responsibilities/job requirements of the food science, dietetics, and nutrition industry.
- Compare personal goals to the opportunities in the occupations.

INTEGRATIONS/LINKAGES

Family and Consumer Sciences National Standards 1.1, 9.0, National FCCLA Programs (STAR Events, Dynamic Leadership, Leaders at Work, Power of One), Gateway Standards (Algebra I-1.01; English II 1.01, 1.03, 2.02, 2.05, 3.01, 3.05, 4.02, 4.03), Technology, Government and community agencies and resources

NUTRITION SCIENCE

STANDARD 10.0

Students will demonstrate leadership, citizenship, and teamwork skills required for success in the family, workplace, and community.

LEARNING EXPECTATIONS

The student will:

10.1 Examine the components of FCCLA and the relationship to the food science and nutrition course of study.
10.2 Assess factors involved in successful leadership skills, citizenship traits, and teamwork traits.
10.3 Plan activities using the FCCLA Planning Process.
10.4 Apply leadership, citizenship, and teamwork skills as an integral part of class activities.

PERFORMANCE STANDARDS

The student:

10.1 Relates the components of FCCLA to classroom activities.
10.2 Assesses teamwork skills that are appropriate to a foods lab situation.
10.3 Implements an activity to promote good nutrition using the FCCLA Planning Process.
10.4 Uses appropriate leadership and citizenship behavior.

SAMPLE PERFORMANCE TASKS

- Classify leadership skills, citizenship traits, and teamwork traits as positive or negative.
- Develop a list of teamwork skills needed in the foods lab.
- Implement Power of One: A Better You, Working on Working, Speaking Out for FCCLA, Family Ties, and Take the Lead
- Invite a state officer, a former FCCLA member, or community leader to speak to the FCCLA chapter members.

INTEGRATION/LINKAGES

Extra-curricular activities, Vocational Student Organizations, Stop the Violence, Student Body, FCCLA National Program Pamphlet, FCCLA Co-Curricular Chapter Handbook, FCCLA Chapter Handbook, English II Gateway Standards